

Sandia National Laboratories, New Mexico

Discharge Permit DP-1845 Quarterly Report

January – March 2019

July 2019



United States Department of Energy
Sandia Field Office

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DISCHARGE PERMIT DP-1845 QUARTERLY REPORT

SANDIA NATIONAL LABORATORIES, NEW MEXICO

July 2019

REPORTING PERIOD: January – March 2019

FACILITY INFORMATION

Facility Name: U.S. Department of Energy/National Nuclear Security Administration (DOE/NNSA)
Discharge Permit Number: DP-1845
Legally Responsible Party: William V. Wechsler, Assistant Manager for Engineering
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PERMIT INFORMATION

Discharge Permit Issued: May 30, 2017
Discharge Permit Term Ends: May 30, 2022
Permitted Discharge Volume: 20,000 gallons per day
Permit Contact Information: Ground Water Quality Bureau (GWQB)
New Mexico Environment Department (NMED)
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OVERVIEW

Discharge Permit (DP)-1845 was issued by the New Mexico Environment (NMED) Ground Water Quality Bureau (GWQB) for discharges via up to three injection wells in a phased Treatability Study of in-situ bioremediation of groundwater at the Sandia National Laboratories, New Mexico, Technical Area-V Groundwater Area of Concern. This report fulfills the quarterly reporting requirements set forth in DP-1845, Section IV.B, Monitoring and Reporting. The reporting period is January 1 through March 31, 2019. All applicable terms and conditions were met for this reporting period. The report is due to NMED GWQB by August 1, 2019.

ABBREVIATIONS AND ACRONYMS

ABCWUA	Albuquerque Bernalillo County Water Utility Authority
AOC	Area of Concern
DOE	U.S. Department of Energy
DP	Discharge Permit
EPA	U.S. Environmental Protection Agency
GWQB	Ground Water Quality Bureau
HWB	Hazardous Waste Bureau
INJ	injection (acronym used for well identification only)
ISB	in-situ bioremediation
LWDS	Liquid Waste Disposal System (acronym used for well identification only)
MW	monitoring well (acronym used for well identification only)
NMED	New Mexico Environment Department
NNSA	National Nuclear Security Administration
SNL/NM	Sandia National Laboratories, New Mexico
TA	Technical Area
TAV	Technical Area-V (acronym used for well identification only)
TA-V	Technical Area-V
TAVG	Technical Area-V Groundwater
TCE	trichloroethene
TS/IM	Treatability Study/Interim Measure
TSWP	Treatability Study Work Plan

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Discharge Permit-1845 (NMED May 2017)

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1.0 **Introduction**

Trichloroethene (TCE) and nitrate have been identified as constituents of concern in groundwater at the Sandia National Laboratories, New Mexico (SNL/NM) Technical Area (TA)-V Groundwater (TAVG) Area of Concern (AOC) based on detections above the U.S. Environmental Protection Agency (EPA) maximum contaminant levels in samples collected from monitoring wells. The maximum contaminant levels and the State of New Mexico drinking water standards, as specified in 20.6.2.3103 New Mexico Administrative Code for TCE and nitrate (as nitrogen) are 5 micrograms per liter and 10 milligrams per liter, respectively.

A phased Treatability Study/Interim Measure (TS/IM) of in-situ bioremediation (ISB) is being implemented to evaluate the effectiveness of ISB as a potential technology to treat the groundwater contamination at the TAVG AOC (New Mexico Environment Department [NMED] April 2016). SNL/NM personnel plan to install up to three injection wells (TAV-INJ1, TAV-INJ2, and TAV-INJ3) at TA-V near the highest contaminant concentrations in groundwater detected at monitoring wells TAV-MW6, TAV-MW10, and LWDS-MW1, respectively. The substrate solution containing essential food and nutrients for biostimulation will be prepared in aboveground tanks. This substrate solution, along with the biodegradation bacteria, will be gravity-injected to groundwater via injection wells.

The NMED Hazardous Waste Bureau (HWB) approved the Revised Treatability Study Work Plan (TSWP) (SNL/NM March 2016) in May 2016 (NMED May 2016). In accordance with the Revised TSWP, the TS/IM will be conducted in two phases. Phase I includes a pilot test followed by full-scale operation at the first injection well (TAV-INJ1). Phase II of the TS/IM includes well installation and full-scale operation at the second and third injection wells (TAV-INJ2 and TAV-INJ3). A decision to install the Phase II injection wells is dependent upon the results of the Phase I operation.

The NMED Ground Water Quality Bureau (GWQB) requires a groundwater Discharge Permit (DP) for the operation of injection wells. NMED GWQB issued DP-1845 to the U.S. Department of Energy/National Nuclear Security Administration (DOE/NNSA) for the SNL/NM TA-V Treatability Study injection wells on May 26, 2017 (NMED May 2017). The DP-1845 term starts on May 30, 2017 and ends on May 30, 2022. Attachment A provides a copy of DP-1845.

SNL/NM personnel completed the pilot test at injection well TAV-INJ1 in June 2018. Based on the results of the pilot test, DOE/NNSA and SNL/NM personnel proposed eight modifications for the full-scale operation at TAV-INJ1 (DOE July 2018). The NMED HWB subsequently approved the modifications (NMED August 2018). The modifications that are

pertinent to DP-1845 were communicated to and acknowledged by the NMED GWQB (NMED July 2018). SNL/NM personnel started the full-scale operation at well TAV-JNJ1 in October 2018. The implementation of the TS/IM is governed by the Revised TSWP and where applicable, the approved modifications for full-scale operation.

This quarterly report provides responses to *Monitoring and Reporting - Terms and Conditions* #10 through #17 in DP-1845 for the January 1 to March 31, 2019 reporting period. Previous quarterly reports (SNL/NM April 2018 and July 2018) have fulfilled the requirements for *Operating Conditions - Terms and Conditions* #3 through #8 in DP-1845. The other Terms and Conditions specified in DP-1845 are NMED GWQB statements of fact and do not require a response.

2.0 **DP-1845 Quarterly Monitoring and Reporting, January – March 2019**

This section responds to the monitoring and reporting requirements in DP-1845 Section IV.B. The Terms and Conditions are repeated verbatim below (in *italics*), followed by DOE/NNSA and SNL/NM personnel responses that discuss relevant activities completed during the reporting period.

2.1 **DP-1845 Terms and Conditions #10**

METHODOLOGY – Unless otherwise approved in writing by NMED, the permittee shall conduct sampling and analysis in accordance with the most recent edition of the following documents.

- a) *Americans Public Health Association, Standard Methods for the Examination of Water and Wastewater (18th, 19th or current)*
- b) *U.S. Environmental Protection Agency, Methods for Chemical Analysis of Water and Waste*
- c) *U.S. Geological Survey, Techniques for Water Resource Investigations of the U.S. Geological Survey*
- d) *American Society for Testing and Materials, Annual Book of ASTM Standards, Part 31. Water*
- e) *U.S. Geological Survey, et al., National Handbook of Recommended Methods for Water Data Acquisition*

- f) *Federal Register, latest methods published for monitoring pursuant to Resource Conservation and Recovery Act regulations*
- g) *American Society of Agronomy, Chemical Methods: Methods of Soil Analysis; Part 1. Physical and Mineralogical Methods; Part 2. Microbiological and Biochemical Properties; Part 3*

DOE/NNSA and SNL/NM Personnel Response: Groundwater sampling activities are performed in accordance with procedures that are consistent with the EPA's Technical Enforcement Guidance Document (EPA 1986). Groundwater samples were analyzed by offsite laboratories using EPA-specified protocols, except for the microbial gene analysis by a proprietary analytical method of SiREM, and the low-level biological indicator gases (methane, ethane, and ethene) analysis by a proprietary analytical method of Pace Analytical Services, LLC. Table 1 summarizes the analyses, analytical methods, and contract analytical laboratories used during the Treatability Study. Additional details on the field methods and measurements, and the quality control procedures for groundwater sampling and analysis are provided in Chapter 1 – Sections 1.2 and 1.3 of the Annual Groundwater Monitoring Report (SNL/NM June 2018).

Table 1
Analyses, Analytical Methods, and Analytical Laboratories

Analyses	Analytical Method	Analytical Laboratory
Alkalinity (total, bicarbonate, and carbonate)	SM 2320B	GEL
Ammonia as nitrogen	EPA 350.1	GEL
Anions (bromide, chloride, fluoride, nitrate, nitrite, orthophosphate as phosphorus, and sulfate)	SW846 9056	GEL
Dissolved Metals (arsenic, calcium, iron, magnesium, manganese, potassium, and sodium)	SW846 3005/6020	GEL
Methane, ethane, and ethene	AM20GAX	PACE
Microbial (<i>Dehalococcoides</i> [Dhc])	Gene-Trac Dhc	SiREM
Nitrate plus nitrite as nitrogen	EPA 353.2	GEL
Sulfide (reactive releasable sulfide)	SW846 Chapter 7.3.4	GEL
Total Organic Carbon	SW846 9060A	GEL
Volatile Organic Compounds	SW846 8260B	GEL

Notes

EPA = U.S. Environmental Protection Agency.

GEL = GEL Laboratories LLC, 2040 Savage Rd, Charleston, SC 29407.

PACE = Pace Analytical Services, LLC, Energy Services Lab, 220 William Pitt Way, Pittsburgh, PA 15238.

SiREM = SiREM, 130 Stone Rd. W, Guelph, Ontario, N1G 3Z2, Canada.

2.2 DP-1845 Terms and Conditions #11

The quarterly reports shall document the influent and discharge volumes from the treatment systems, quarterly groundwater and effluent sampling results, and any operations/maintenance activities performed for the prior quarter.

Quarterly monitoring shall be performed during the following periods and submitted as follows.

- *January 1st through March 31st (first quarter) – due by August 1st*
- *April 1st through June 30th (second quarter) – due by November 1st*
- *July 1st through September 30th (third quarter) – due by February 1st*
- *October 1st through December 31st (fourth quarter) – due by May 1st*

DOE/NNSA and SNL/NM Personnel Response: Terms and Conditions #11 is divided into four sub-requirements. The requirement is shown in *italics* and the response is not italicized.

a) *Quarterly influent and effluent volumes*

Treatment system influent is comprised of potable water conveyed directly from a fire hydrant to two aboveground 5,000-gallon polyethylene tanks. The influent (potable water) is mixed with various chemicals to prepare the treatment solution that is stored in the tanks prior to discharge (injection) to groundwater. The solution discharged from the tanks and injected into the groundwater is the effluent permitted under DP-1845. The terms effluent and discharge are synonymous in this report.

The full-scale operation at TAV-INJ1 started in October 2018. Influent volume for each tank was measured using a totalizing flow meter. Discharges (injections) started on November 1, 2018 through well TAV-INJ1 and continued throughout the reporting period. Table 2 provides the influent and discharge volumes from the system for this reporting period.

Table 2
Quarterly Influent and Effluent Volumes during January – March 2019

Reporting Period	Influent Volume (gal)	Effluent Volume (gal)
January 2019	68,538	66,667
February 2019	96,863	97,214
March 2019	120,268	121,708
Total in this Reporting Period	285,669	285,589

Notes

The variance between the influent volume and effluent volume could be due to the accuracies of the flow meters. Influent volume was measured by two Zenner Cast Iron Turbine Meters, one for each tank. Effluent volume was measured by a Neptune 2-inch T-10 Positive Displacement Meter. Based on manufacturer specifications, the accuracies of the Zenner Meters are within 99.1 to 101.1 percent. The accuracies of the Neptune Meter are within 98.0 and 100.2 percent.
gal = Gallon.

b) Quarterly groundwater and effluent sampling results

The effluent consists of the treatment solution that is prepared in aboveground tanks and is monitored (sampled) at injection well TAV-INJ1, which is the permitted discharge point.

Monitoring well TAV-MW6, located approximately 50 feet southeast of the injection well, is designated as the ISB performance monitoring well after the full-scale injections started on November 1, 2018 at well TAV-INJ1. Groundwater monitoring results at wells TAV-INJ1 and TAV-MW6 represent the groundwater conditions in the ISB treatment zone. This understanding was communicated to and acknowledged by the NMED GWQB (NMED July 2018).

Groundwater samples were not collected during the injections at well TAV-INJ1 because the well was being used for the continuous discharge of the treatment solution and the water in the well casing was predominantly the injected solution of known chemical composition. This modification was approved for full-scale operation (NMED August 2018). Groundwater sampling at well TAV-INJ1 will resume one month after the conclusion of the full-scale injections in accordance with the Revised TSWP (SNL/NM March 2016).

Groundwater in well TAV-MW6 is in the nearest proximity to represent the treatment solution after being discharged to groundwater. Sampling was conducted monthly at well TAV-MW6 during this reporting period. The results and evaluation are presented together with the other monitoring wells required under DP-1845 in response to Terms and Conditions #17.

c) Operation/maintenance activities performed during the quarter, if any

Full-scale operation of the ISB Treatability Study began in October 2018 at injection well TAV-INJ1. The treatment solution is designed to enhance the degradation of TCE and nitrate in the Regional Aquifer at TA-V. The treatment solution was prepared in two aboveground 5,000-gallon polyethylene tanks prior to each injection. After the water quality was evaluated using electronic sondes and meters, the treatment solution in the tanks was gravity-injected to the groundwater via injection well TAV-INJ1. Since the first injection on November 1, 2018, a total of 88 injections cumulating 423,162 gallons of treatment solution was discharged to groundwater by the end of this reporting period, averaging approximately 4,809 gallons per injection. By the end of this reporting period, approximately 80 percent of the planned total injection volume (530,000 gallons) has been injected.

The mixing ratio for the KB-1 dechlorinating bacteria, a product purchased from SiREM, is approximately 1.1 liter per 5,000 gallons of treatment solution. By the end of this reporting period, a total of 90 liters of KB-1 dechlorinating bacteria were injected along with the treatment solution through well TAV-INJ1.

The full-scale operation at TAV-INJ1 is on-going and the injection phase is anticipated to conclude in April 2019.

d) *Submittal of Quarterly Report*

This quarterly report addresses the reporting period of January 1 through March 31, 2019. This is the seventh quarterly report following the issuance of DP-1845 in May 2017.

2.3 **DP-1845 Terms and Conditions #12**

Quarterly reports shall include the following general information:

- a) *any periodic test of mechanical integrity conducted*
- b) *any replacement of primary or secondary vessels or associated treatment system infrastructure with an accompanying narrative explanation of the reasons for the decision to replace the vessels*
- c) *any well work-overs conducted*
- d) *any additional operation changes with the potential to markedly affect the discharge*

DOE/NNSA and SNL/NM Personnel Response:

- a) No periodic testing of mechanical integrity by a licensed Professional Engineer was necessary or required during this reporting period. However, daily visual inspections were conducted by field technicians during the full-scale operation. Items inspected include the aboveground injection system assembly, deoxygenation tanks, wellhead assembly, and associated instrumentation. Daily inspection records are kept on site during operation and will be submitted to the SNL/NM Customer Funded Records Center at the conclusion of the project.
- b) No replacement of primary or secondary vessels or associated treatment system infrastructure was necessary or required during this reporting period.

- c) No well work-overs (redevelopments) were necessary or required during this reporting period.
- d) No additional operational changes occurred during the reporting period that would markedly affect the discharge.

2.4 **DP-1845 Terms and Conditions #13**

Quarterly reports shall include the following system performance information:

- a) *monthly average, maximum, and minimum values for flow rate and volume of effluent transferred to each injection well*
- b) *the totalized monthly volume of effluent transferred to each injection well*
- c) *monthly average, maximum, and minimum values of injection water level (pressure head) above static level for each injection well*
- d) *the volume pumped from each extraction well*

Each UIC well shall have a dedicated flow meter. Flow meters shall be inspected and calibrated in accordance with the associated manufacturer's recommendations.

DOE/NNSA and SNL/NM Personnel Response:

- a) Table 3 provides the monthly average, maximum, and minimum values for the flow rate and volumes of effluent transferred to well TAV-INJ1 during this reporting period. Discharge to the injection well began on November 1, 2018. The injection phase is anticipated to conclude in April 2019.

Table 3
Flow Rate and Effluent Volume Transferred to Injection Well TAV-INJ1
during January – March 2019

Flow Rate (gpm) ^a			Daily Effluent Volume (gpd) ^a			Total Volume (gal)
Average	Maximum	Minimum	Average	Maximum	Minimum	
January						
13.9	20.1	11.9	4,662	4,914	4,231	66,667
February						
13.0	29.5	3.4	4,826	5,128	4,463	97,214
March						
12.4	28.3	3.4	4,848	4,984	4,638	121,708

Notes

^aAverage, maximum, and minimum values for the flow rate and daily effluent volume occurred when injection system was in operation.

gal = Gallon.

gpm = Gallon per minute.

gpd = Gallon per day.
 INJ = Injection well (acronym used for well identification only).
 TAV = Technical Area-V (acronym used for well identification only).

- b) The totalized monthly volume of effluent gravity-drained (transferred) to well TAV-INJ1 was 66,667 gallons, 97,214 gallons, and 121,708 gallons in January, February, and March 2019, respectively (Table 3).
- c) Table 4 provides the monthly average, maximum, and minimum values of water level increases above the static water level (static at approximately 511.6 feet below ground surface) during injections at well TAV-INJ1 for the reporting period. The maximum water level rise in well TAV-INJ1 was 372.3 feet above static level, which is approximately 140 feet below ground surface. The water levels returned to within a few feet near the static level in a few hours after each injection was completed. A pressure transducer with data logger is used for obtaining continuous water level readings.

Table 4
Water Levels Above Static Level at Injection Well TAV-INJ1
during January – March 2019^a

January			February			March		
Average (feet)	Maximum (feet)	Minimum (feet)	Average (feet)	Maximum (feet)	Minimum (feet)	Average (feet)	Maximum (feet)	Minimum (feet)
323.2	349.0	308.9	241.0	372.3	120.0	211.0	311.4	128.4

Notes

^a Average, maximum, and minimum values for water levels occurred when injection system was in operation.

- d) No groundwater was extracted from well TAV-INJ1 for use in preparing the treatment solution (effluent). The influent (potable water) was obtained from a fire hydrant.

A dedicated flow meter (Neptune 2-inch T-10 Positive Displacement Meter, Lead Free Bronze) was used to monitor effluent volumes injected at well TAV-INJ1. The flow meter was calibrated by the manufacturer and inspected daily before use.

2.5 **DP-1845 Terms and Conditions #14**

The permittee shall develop a groundwater elevation contour map on a quarterly basis using the top of casing elevation data and quarterly depth-to-most-shallow groundwater measurements obtained from the groundwater monitoring wells required by this Discharge Permit.

The groundwater elevation contour map shall depict the groundwater flow direction based on the groundwater elevation contours. Groundwater elevations between monitoring well locations shall be estimated using common interpolation methods. A contour interval

appropriate to the data shall be used, but in no case shall the interval be greater than two feet. Groundwater elevation contour maps shall depict the groundwater flow direction, using arrows, based on the orientation of the groundwater elevation contours, and the location and identification of each monitoring well and contaminant source. The groundwater elevation contour map shall be submitted to NMED in the quarterly monitoring reports.

DOE/NNSA and SNL/NM Personnel Response:

Figure 1 shows the January 2019 groundwater elevation contour map (potentiometric surface figure) for the Regional Aquifer at TA-V. The groundwater elevation contours are similar to the baseline October 2017 contours (SNL January 2018). Groundwater flows generally to the west and southwest in the vicinity of the ISB Treatability Study.

Increases in water levels were observed in injection well TAV-INJ1 and nearby monitoring well TAV-MW6 during the injections; these wells are screened across the groundwater table and are located approximately 50 feet apart. The water levels in well TAV-MW6 were observed to instantaneously rise and fall with the injections of treatment solution into TAV-INJ1. The average peak head imposed by injections at TAV-INJ1 and recorded at TAV-MW6 was approximately 1.25 feet above static. Following injections the head in TAV-MW6 was observed to return to static without a sustained increase.

The water level at TAV-MW7 was not observed to respond to injections with immediate pressure pulses as was observed at TAV-MW6. However, between January and March 2019, the water pressure at TAV-MW7 rose approximately 0.85 feet. Additionally, between January and March 2019, during periods where injections were stopped (e.g., weekends) the water level in TAV-MW7 dropped between 0.2 and 0.4 feet. Well TAV-MW7 is screened approximately 90 feet below the groundwater table and located approximately 30 feet away from well TAV-INJ1. The pressure response recorded at TAV-MW7 supports the concept that the screen section of this well is isolated from the water-table hydrostratigraphic unit. The cumulative pressure increase in well TAV-MW7 resulted from the mounded effluent in and around TAV-INJ1 that was exerting pressure on the surrounding geological formation.

The full-scale injections have not created a long-term impact on the shape of the potentiometric surface at TA-V.

2.6 DP-1845 Terms and Conditions #15

NMED shall have the option to perform downhole inspections of all monitoring and UIC wells identified in this Discharge Permit. NMED shall establish the inspection data and provide at least a 60-day notice to the permittee by certified mail. The permittee shall have

any existing dedicated pumps removed at least 48 hours prior to NMED inspection to allow adequate settling time of sediment agitated from pump removal.

Should a facility not have existing dedicated pumps, but decide to install pumps in any of the monitoring wells, NMED shall be notified at least 90 days prior to pump installation so that a downhole well inspection(s) can be scheduled prior to pump replacement.

All confirmation analysis will be conducted by an independent environmental laboratory that is certified under the National Environmental Laboratory Accreditation Program.

DOE/NNSA and SNL/NM Personnel Response: All wells associated with this DP are available for inspection by NMED GWQB. No inspections were requested or conducted by NMED GWQB during this reporting period. Likewise, no confirmation sampling was requested or conducted by NMED GWQB during this reporting period.

2.7 **DP-1845 Terms and Conditions #16**

Groundwater samples shall be collected from each new injection well and associated monitoring well prior to discharge, and analyzed for the constituents listed below to establish baseline conditions prior to substrate injection.

- *Alkalinity (total, bicarbonate and carbonate)*
- *Ammonia (as nitrogen)*
- *Anions (bromide, chloride, fluoride, nitrite and sulfate)*
- *Dehalococcoides*
- *Dissolved metals (arsenic, calcium, iron, magnesium, manganese, potassium, sodium)*
- *Methane/ethane*
- *Nitrate as nitrogen*
- *Nitrite as nitrogen*
- *Nitrate plus nitrite (as nitrogen)*
- *Orthophosphate (as phosphorus)*
- *Total organic carbon*
- *Sulfide*
- *Volatile organic compounds*

Field parameters pH, specific conductivity, temperature, turbidity, dissolved oxygen, and oxidation-reduction potential shall be collected.

DOE/NNSA and SNL/NM Personnel Response: Results of the baseline groundwater samples and field parameter measurements for injection well TAV-INJ1 and associated

monitoring wells were provided in the October – December 2017 Quarterly Report (SNL/NM April 2018). No new injection wells were installed during this reporting period.

2.8 **DP-1845 Terms and Conditions #17**

The permittee shall monitor the groundwater wells TAV-MW6, TAV-MW7, TAV-MW10, and LWDS-MW1 quarterly to determine any change to aquifer chemistry and aquifer flow direction that may be the result of injection.

This quarterly monitoring shall include analysis for the following analytes:

- *TCE*
- *Nitrate as nitrogen*
- *Nitrite as nitrogen*
- *Nitrate plus nitrite (as nitrogen)*
- *Arsenic*
- *Iron*
- *Manganese*
- *cis-1,2-DCE*
- *Vinyl chloride*
- *Ethene*

Annual sampling will include general chemistry, radiological screening parameters, and total metals as proposed by the permittee to supplement waste characterization requirements and as required under the SNL Compliance Order on Consent.

If the chemical quality of the groundwater being injected changes over time, NMED may require the permittee to conduct geochemical modeling to predict the interaction between the injection fluid and receiving groundwater. Results of all geochemical modeling shall be provided to NMED and shall include predictions on any changes to aquifer porosity and hydraulic conductivity that may result from mineral precipitation or dissolution.

DOE/NNSA and SNL/NM Personnel Response:

As stated in response to Terms and Conditions #11, monitoring well TAV-MW6, located approximately 50 feet away from the injection well, was designated as the ISB performance monitoring well after the full-scale injections started on November 1, 2018 at well TAV-INJ1. It is anticipated that the treatment solution would reach well TAV-MW6 and this well is monitored for the effectiveness of the ISB. The sampling frequency for well TAV-MW6 is quarterly per DP-1845; however, it was sampled monthly during this reporting period per requirements of the Revised TSWP (SNL/NM March 2016).

Even though well TAV-MW7 is geographically located closer to the injection well than well TAV-MW6 (Figure 1), no change to the groundwater chemistry in well TAV-MW7 is anticipated as a result of the treatment solution because the well is screened 90 feet below the groundwater table. Well TAV-MW7 is monitored for any vertical impact on groundwater chemistry from the full-scale injections at TAV-INJ1. The sampling frequency for well TAV-MW7 is quarterly per DP-1845.

Wells TAV-MW10 and LWDS-MW1 are the closest monitoring points outside the ISB treatment zone and are monitored for any impact on groundwater chemistry from the injections at TAV-INJ1. The sampling frequency for these two wells is quarterly per DP-1845.

Table 5 lists the sampling dates for the four monitoring wells (TAV-MW6, TAV-MW7, TAV-MW10, and LWDS-MW1) for this reporting period.

Table 5
Sampling Dates for Monitoring Wells TAV-MW6, TAV-MW7, TAV-MW10, and
LWDS-MW1 during January – March 2019

Monitoring Well	Sampling Dates
TAV-MW6	22 Jan 2019, 25 Feb 2019, 26 Mar 2019
TAV-MW7	28 Jan 2019
TAV-MW10	7 Feb 2019
LWDS-MW1	11 Feb 2019

Notes

LWDS = Liquid Waste Disposal System (acronym used for well identification only).
MW = Monitoring well (acronym used for well identification only).
TAV = Technical Area-V (acronym used for well identification only).

Tables A-1 through A-4 in Appendix A provide the groundwater sampling results for all of the required analytes. None of the analytical results exceeded the groundwater standards as specified in 20.6.2.3103 New Mexico Administrative Code, except for the TCE detections in wells TAV-MW6, TAV-MW10, and LWDS-MW1, and nitrate/nitrate plus nitrite detections in wells TAV-MW10 and LWDS-MW1. TCE concentrations were 6.24, 7.42, and 7.02 µg/L in the samples collected in January, February, and March 2019, respectively, in well TAV-MW6. TCE concentrations were 14.6 and 15.2 µg/L in the samples collected in February 2019 in wells TAV-MW10 and LWDS-MW1, respectively. All results for these samples exceeded the groundwater standard of 5 µg/L for TCE. Nitrate/nitrate plus nitrite concentrations were 10.3 and 11.3 mg/L, respectively, in the sample collected in February 2019 in well TAV-MW10. Nitrate/nitrate plus nitrite concentrations were 12.6 and 12.1 mg/L, respectively, in the sample collected in February 2019 in well LWDS-MW1. All results for these samples exceeded the groundwater standard of 10 mg/L for nitrate. The TCE and nitrate/nitrate plus nitrite concentrations are similar to historical values at these wells (SNL/NM June 2018) and are not result of the injections associated with the full-scale operation at TAV-INJ1.

The initial requirement for annual sampling and analyses (general chemistry, radiological screening parameters, and total metals) to supplement the waste characterization requirements became inapplicable following notification by the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) that groundwater obtained from remedial activities cannot be discharged to the sewer system (ABCWUA January 2018). Currently, the wastewater generated in the groundwater sampling process is managed by the SNL/NM Hazardous Waste Handling Unit and is shipped offsite for proper disposal in compliance with applicable regulatory requirements.

3.0 **References**

ABCWUA, see Albuquerque Bernalillo County Water Utility Authority.

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Figures

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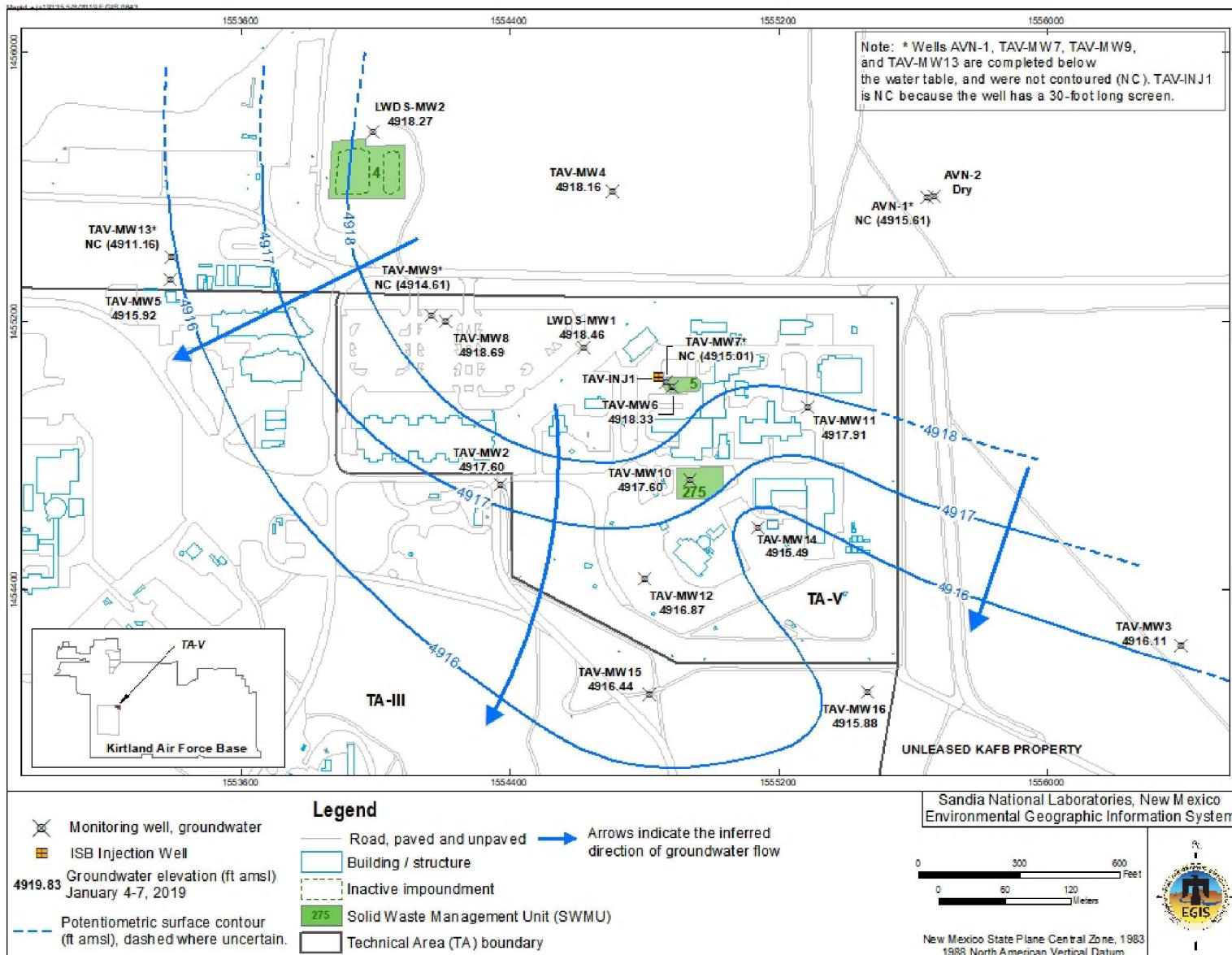


Figure 1
Groundwater Elevation Contour Map for the TAVG AOC (January 2019)

Appendix A

Analytical Results

Table A-1
Analytical Results for Groundwater Samples Collected at Monitoring Well TAV-MW6, January – March 2019

Sample Date	Analyte ^a	Result ^b	MDL ^c	PQL ^d	Units	Groundwater Standard ^e	Lab Qualifier ^f	Validation Qualifier ^g	Sample No.	Analytical Method ^h	Lab ⁱ
22-Jan-19	Trichloroethene	6.24	0.3	1	µg/L	0.005 mg/L (5.0 µg/L)			107087-001	SW846 8260B	GEL
22-Jan-19	Nitrate	6.83	0.33	1	mg/L	10.0 mg/L			107087-004	SW846 9056A	GEL
22-Jan-19	Nitrite	ND	0.033	0.1	mg/L	1.0 mg/L	U		107087-004	SW846 9056A	GEL
22-Jan-19	Nitrate plus nitrite as N	8.85	0.85	2.5	mg/L	10.0 mg/L			107087-005	EPA 353.2	GEL
22-Jan-19	Arsenic	0.00239	0.002	0.005	mg/L	0.01 mg/L	J		107087-007	SW846 3005A/6020B	GEL
22-Jan-19	Iron	ND	0.033	0.1	mg/L	1.0 mg/L	U		107087-007	SW846 3005A/6020B	GEL
22-Jan-19	Manganese	ND	0.001	0.005	mg/L	0.2 mg/L	NU		107087-007	SW846 3005A/6020B	GEL
22-Jan-19	Dichloroethene, cis-1,2-	0.87	0.3	1	µg/L	0.07 mg/L (70 µg/L)	J		107087-001	SW846 8260B	GEL
22-Jan-19	Vinyl chloride	ND	0.3	1	µg/L	0.002 mg/L (2 µg/L)	U		107087-001	SW846 8260B	GEL
22-Jan-19	Ethene	ND	0.005	0.1	µg/L	NE	U	UJ	107089-001	AM20GAX	PACE
25-Feb-19	Trichloroethene	7.42	0.3	1	µg/L	0.005 mg/L (5.0 µg/L)			107749-001	SW846 8260B	GEL
25-Feb-19	Nitrate	6.4	0.165	0.5	mg/L	10.0 mg/L			107749-004	SW846 9056A	GEL
25-Feb-19	Nitrite	ND	0.033	0.1	mg/L	1.0 mg/L	U		107749-004	SW846 9056A	GEL
25-Feb-19	Nitrate plus nitrite as N	8.02	0.17	0.5	mg/L	10.0 mg/L			107749-005	EPA 353.2	GEL
25-Feb-19	Arsenic	ND	0.002	0.005	mg/L	0.01 mg/L	U		107749-007	SW846 3005A/6020B	GEL
25-Feb-19	Iron	ND	0.033	0.1	mg/L	1.0 mg/L	U		107749-007	SW846 3005A/6020B	GEL
25-Feb-19	Manganese	ND	0.001	0.005	mg/L	0.2 mg/L	U		107749-007	SW846 3005A/6020B	GEL
25-Feb-19	Dichloroethene, cis-1,2-	1.37	0.3	1	µg/L	0.07 mg/L (70 µg/L)			107749-001	SW846 8260B	GEL
25-Feb-19	Vinyl chloride	ND	0.3	1	µg/L	0.002 mg/L (2 µg/L)	U		107749-001	SW846 8260B	GEL
25-Feb-19	Ethene	ND	0.005	0.1	µg/L	NE	U	UJ	107748-001	AM20GAX	PACE
26-Mar-19	Trichloroethene	7.02	0.3	1	µg/L	0.005 mg/L (5.0 µg/L)	B		107990-001	SW846 8260B	GEL
26-Mar-19	Nitrate	6.52	0.165	0.5	mg/L	10.0 mg/L			107990-004	SW846 9056A	GEL
26-Mar-19	Nitrite	ND	0.033	0.1	mg/L	1.0 mg/L	U		107990-004	SW846 9056A	GEL
26-Mar-19	Nitrate plus nitrite as N	7.87	0.17	0.5	mg/L	10.0 mg/L			107990-005	EPA 353.2	GEL
26-Mar-19	Arsenic	0.00218	0.002	0.005	mg/L	0.01 mg/L	J		107990-007	SW846 3005A/6020B	GEL
26-Mar-19	Iron	ND	0.033	0.1	mg/L	1.0 mg/L	U		107990-007	SW846 3005A/6020B	GEL
26-Mar-19	Manganese	ND	0.001	0.005	mg/L	0.2 mg/L	U		107990-007	SW846 3005A/6020B	GEL
26-Mar-19	Dichloroethene, cis-1,2-	0.92	0.3	1	µg/L	0.07 mg/L (70 µg/L)	J		107990-001	SW846 8260B	GEL
26-Mar-19	Vinyl chloride	ND	0.3	1	µg/L	0.002 mg/L (2 µg/L)	U		107990-001	SW846 8260B	GEL
26-Mar-19	Ethene	ND	0.008	0.1	µg/L	NE	U	UJ	107994-001	AM20GAX	PACE

Refer to footnotes at the end of this appendix.

Table A-2
Analytical Results for Groundwater Samples Collected at Monitoring Well TAV-MW7, January – March 2019

Sample Date	Analyte ^a	Result ^b	MDL ^c	PQL ^d	Units	Groundwater Standard ^e	Lab Qualifier ^f	Validation Qualifier ^g	Sample No.	Analytical Method ^h	Lab ⁱ
28-Jan-19	Trichloroethene	ND	0.3	1	µg/L	0.005 mg/L (5.0 µg/L)	U		106941-001	SW846 8260B	GEL
28-Jan-19	Nitrate	3.81	0.033	0.1	mg/L	10.0 mg/L			107110-001	SW846 9056A	GEL
28-Jan-19	Nitrite	ND	0.033	0.1	mg/L	1.0 mg/L	U		107110-001	SW846 9056A	GEL
28-Jan-19	Nitrate plus nitrite as N	3.98	0.17	0.5	mg/L	10.0 mg/L			106941-002	EPA 353.2	GEL
28-Jan-19	Arsenic	0.00209	0.002	0.005	mg/L	0.01 mg/L	J		106941-003	SW846 3005A/6020B	GEL
28-Jan-19	Iron	ND	0.033	0.1	mg/L	1.0 mg/L	U		106941-003	SW846 3005A/6020B	GEL
28-Jan-19	Manganese	ND	0.001	0.005	mg/L	0.2 mg/L	U		106941-003	SW846 3005A/6020B	GEL
28-Jan-19	Dichloroethene, cis-1,2-	ND	0.3	1	µg/L	0.07 mg/L (70 µg/L)	U		106941-001	SW846 8260B	GEL
28-Jan-19	Vinyl chloride	ND	0.3	1	µg/L	0.002 mg/L (2 µg/L)	U		106941-001	SW846 8260B	GEL
28-Jan-19	Ethene	ND	0.005	0.1	µg/L	NE	U	UJ	107111-001	AM20GAX	PACE

Table A-3
Analytical Results for Groundwater Samples Collected at Monitoring Well TAV-MW10, January – March 2019

Sample Date	Analyte ^a	Result ^b	MDL ^c	PQL ^d	Units	Groundwater Standard ^e	Lab Qualifier ^f	Validation Qualifier ^g	Sample No.	Analytical Method ^h	Lab ⁱ
7-Feb-19	Trichloroethene	14.6	0.3	1	µg/L	0.005 mg/L (5.0 µg/L)			107154-001	SW846 8260B	GEL
7-Feb-19	Nitrate	10.3	0.165	0.5	mg/L	10.0 mg/L			107158-001	SW846 9056A	GEL
7-Feb-19	Nitrite	ND	0.165	0.5	mg/L	1.0 mg/L	U		107158-001	SW846 9056A	GEL
7-Feb-19	Nitrate plus nitrite as N	11.3	0.17	0.5	mg/L	10.0 mg/L			107154-002	EPA 353.2	GEL
7-Feb-19	Arsenic	0.00304	0.002	0.005	mg/L	0.01 mg/L	J		107154-003	SW846 3005A/6020B	GEL
7-Feb-19	Iron	ND	0.033	0.1	mg/L	1.0 mg/L	U		107154-003	SW846 3005A/6020B	GEL
7-Feb-19	Manganese	ND	0.001	0.005	mg/L	0.2 mg/L	U		107154-003	SW846 3005A/6020B	GEL
7-Feb-19	Dichloroethene, cis-1,2-	2.4	0.3	1	µg/L	0.07 mg/L (70 µg/L)			107154-001	SW846 8260B	GEL
7-Feb-19	Vinyl chloride	ND	0.3	1	µg/L	0.002 mg/L (2 µg/L)	U		107154-001	SW846 8260B	GEL
7-Feb-19	Ethene	ND	0.005	0.1	µg/L	NE	U	UJ	107160-001	AM20GAX	PACE

Table A-4
Analytical Results for Groundwater Samples Collected at Monitoring Well LWDS-MW1, January – March 2019

Sample Date	Analyte ^a	Result ^b	MDL ^c	PQL ^d	Units	Groundwater Standard ^e	Lab Qualifier ^f	Validation Qualifier ^g	Sample No.	Analytical Method ^h	Lab ⁱ
11-Feb-19	Trichloroethene	15.2	0.3	1	µg/L	0.005 mg/L (5.0 µg/L)			107156-001	SW846 8260B	GEL
11-Feb-19	Nitrate	12.6	0.165	0.5	mg/L	10.0 mg/L			107159-001	SW846 9056A	GEL
11-Feb-19	Nitrite	ND	0.033	0.1	mg/L	1.0 mg/L	U		107159-001	SW846 9056A	GEL
11-Feb-19	Nitrate plus nitrite as N	12.1	0.17	0.5	mg/L	10.0 mg/L			107156-002	EPA 353.2	GEL
11-Feb-19	Arsenic	0.00425	0.002	0.005	mg/L	0.01 mg/L	J		107156-003	SW846 3005A/6020B	GEL
11-Feb-19	Iron	ND	0.033	0.1	mg/L	1.0 mg/L	U		107156-003	SW846 3005A/6020B	GEL
11-Feb-19	Manganese	ND	0.001	0.005	mg/L	0.2 mg/L	U		107156-003	SW846 3005A/6020B	GEL
11-Feb-19	Dichloroethene, cis-1,2-	3.42	0.3	1	µg/L	0.07 mg/L (70.0 µg/L)			107156-001	SW846 8260B	GEL
11-Feb-19	Vinyl chloride	ND	0.3	1	µg/L	0.002 mg/L (2.0 µg/L)	U		107156-001	SW846 8260B	GEL
11-Feb-19	Ethene	ND	0.005	0.1	µg/L	NE	U	UJ	107161-001	AM20GAX	PACE

Refer to footnotes at the end of this appendix.

Footnotes for Appendix A - Analytical Results Tables

%	= Percent.
DP	= Discharge Permit.
EPA	= U.S. Environmental Protection Agency.
LWDS	= Liquid Waste Disposal System.
µg/L	= Micrograms per liter.
mg/L	= Milligrams per liter.
MW	= Monitoring well.
No.	= Number.
TAV	= Technical Area-V
VOC	= Volatile organic compounds.

^aAnalyte

The analyte list is specified in DP-1845 Terms and Conditions #17. Samples for metal analyses were filtered in the field.

^bResult

Detected VOCs are presented in the tables.

Bold	= Value exceed the established Groundwater Standard.
ND	= Not detected (at method detection limit).

^cMDL

MDL = Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix specific.

^dPQL

PQL = Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

^eGroundwater Standard

Groundwater Standards are from 20.6.2.3103 New Mexico Administrative Code (NMAC).

NE = Not established in 20.6.2.3103 NMAC.

^fLab Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

B = The analyte was found in the blank above the effective MDL.

J = The associated value is an estimated quantity.

N = Results associated with a spike analysis that was outside control limits.

U = Analyte is absent or below the method detection limit.

^gValidation Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

UJ = The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

^hAnalytical Method

EPA, 1986 (and updates), "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd edition, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1984, "Methods for Chemical Analysis of Water and Wastes." EPA 600-4-79-020, U.S. Environmental Protection Agency, Cincinnati, Ohio.

AM20GAX = Proprietary method of Pace Analytical Services, LLC.

ⁱLab

GEL = GEL Laboratories LLC, 2040 Savage Rd, Charleston, SC 29407.

PACE = Pace Analytical Services, LLC, Energy Services Lab, 220 William Pitt Way, Pittsburgh, PA 15238.

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Attachment A
Ground Water Discharge Permit
Sandia National Laboratories/New Mexico
Discharge Permit DP-1845
(NMED May 2017)

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**NEW MEXICO
ENVIRONMENT DEPARTMENT**



SUSANA MARTINEZ
Governor

JOHN A. SANCHEZ
Lieutenant Governor

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BUTCH TONGATE
Cabinet Secretary

J.C. BORREGO
Deputy Secretary

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

May 26, 2017

Mr. James Todd, Assistant Manager for Engineering
U.S. Department of Energy
P.O. Box 5400
Albuquerque, NM 87185

RE: Discharge Permit, DP-1845, Sandia National Laboratories/New Mexico

Dear Mr. Todd:

The New Mexico Environment Department (NMED) issues the enclosed Discharge Permit, DP-1845, to the U. S. Department of Energy/National Nuclear Security Administration, Sandia Field Office (permittee) pursuant to the New Mexico Water Quality Act (WQA), NMSA 1978 §§74-6-1 through 74-6-17, and the New Mexico Ground and Surface Water Protection Regulations, 20.6.2 NMAC.

The Discharge Permit contains terms and conditions that shall be complied with by the permittee and are enforceable by NMED pursuant to Section 20.6.2.3104 NMAC and NMSA 1978 §74-6-5 and §74-6-10. Please be aware that this Discharge Permit may contain conditions that require the permittee to implement operational, monitoring, or closure actions by a specified deadline.

Issuance of this Discharge Permit does not relieve the permittee of the responsibility to comply with the WQA, the Ground and Surface Water Protection Regulations, and any other applicable federal, state, and/or local laws, regulations, zoning requirements, and nuisance ordinances.

Pursuant to Paragraph (4) of Subsection H of 20.6.2.3109 NMAC, the term of the Discharge Permit shall be five years from the effective date. The term of this Discharge Permit will end on May 26, 2022.

NMED requests that the permittee submit an application for renewal (or renewal and modification) at least 180 days prior to the date the Discharge Permit term ends.

May 26, 2017

Page 2 of 2

An invoice for the Discharge Permit Fee of \$3,450 is being sent under separate cover. Payment of the Discharge Permit Fee must be received by NMED within 30 days of the date the Discharge Permit is issued.

If you have any questions, please contact Kellie Jones at (505) 827-2949. Thank you for your cooperation during this Discharge Permit review.

Sincerely,

Michelle Hunter for

Michelle Hunter, Chief
Ground Water Quality Bureau

MH:kj

Encs: Discharge Permit, DP-1845
Discharge Permit Summary
Ground Water Discharge Permit Monitoring Well Construction and Abandonment
Conditions, Revision 1.1, March 2011

cc: John Rhoderick, District Manager, NMED District I (electronic copy)
John Romero, Office of the State Engineer (electronic copy)

GROUND WATER DISCHARGE PERMIT
Sandia National Laboratories/New Mexico
Discharge Permit-1845

I. INTRODUCTION

The New Mexico Environment Department (NMED) Ground Water Quality Bureau (GWQB) issues this Discharge Permit (DP-1845) for discharges via Class V underground injection control (UIC) wells to the U. S. Department of Energy/National Nuclear Security Administration, Sandia Field Office (permittee) pursuant to the New Mexico Water Quality Act (WQA), NMSA 1978 §§74-6-1 through 74-6-17, and the New Mexico Water Quality Control Commission (WQCC) Ground and Surface Water Protection Regulations, 20.6.2 NMAC.

NMED's purpose in issuing this Discharge Permit, and in imposing the requirements and conditions specified herein, is to control the discharge of water contaminants from Sandia National Laboratories (SNL)/New Mexico (facility) into ground and surface waters, so as to protect ground and surface waters for present and potential future use as domestic and agricultural water supply and other uses and protect public health. In issuing this Discharge Permit, NMED has determined that the requirements of Subsection C of 20.6.2.3109 NMAC have been or will be met. Pursuant to Section 20.6.2.3104 NMAC, it is the responsibility of the permittee to comply with the terms and conditions of this Discharge Permit; failure to do so may result in an enforcement action(s) by NMED (20.6.2.1220 NMAC).

The activities that produce the discharge, the location of the discharge, and the quantity, quality, and flow characteristics of the discharge are briefly described as follows.

Up to 20,000 gallons per day (gpd) of groundwater will be extracted from TAV-INJ1, TAV-INJ2, and TAV-INJ3, pursuant to regulatory activities being conducted under the SNL Compliance Order on Consent overseen by the NMED Hazardous Waste Bureau in accordance with the New Mexico Hazardous Waste Act and the New Mexico Solid Waste Act. The groundwater is to be extracted from within a contaminant plume affected by trichloroethene (TCE) and nitrate, mixed with substrate solution components and biodegradation bacteria to facilitate bioremediation, and then gravity-fed into three underground injection control wells (TAV-INJ1, TAV-INJ2, and TAV-INJ3) within the contaminant plume. Daily injections will be followed with approximately 100 gallons of chase water, consisting of potable water (without amendments) deoxygenated by sparging with argon gas, to effectively push bioremediation reagents into the groundwater formation.

The discharge contains water contaminants that may be elevated above the standards of Section 20.6.2.3103 NMAC and/or the presence of toxic pollutants as defined in Subsection WW of 20.6.2.7 NMAC and as allowed under 20.6.2.3109.D(1). Data collected from on-site monitoring wells document groundwater contamination attributed to one or more sources at this facility. Groundwater quality standards for TCE and nitrate have been exceeded according to the criteria of Sections 20.6.2.3101 and 20.6.2.3103 NMAC.

The facility is located in Albuquerque on Kirtland Air Force Base, approximately one mile southwest of the intersection of Pennsylvania Avenue and TA-III/V in Section 20, Township 9N,

Range 4E, Bernalillo County. Groundwater most likely to be affected is at a depth of approximately 500 feet and has a total dissolved solids concentration (TDS) of approximately 423 milligrams per liter (mg/L).

The application (i.e., discharge plan) consists of the materials submitted by the permittee dated July 25, 2016 and materials contained in the administrative record prior to issuance of this Discharge Permit. The discharge shall be managed in accordance with all conditions and requirements of this Discharge Permit.

Pursuant to Section 20.6.2.3109 NMAC, NMED reserves the right to require a Discharge Permit Modification in the event NMED determines that the requirements of 20.6.2 NMAC are being or may be violated or the standards of Section 20.6.2.3103 NMAC are being or may be violated. This may include a determination that structural controls and/or management practices approved under this Discharge Permit are not protective of groundwater quality, and that more stringent requirements to protect groundwater quality may be required by NMED. The permittee may be required to implement abatement of water pollution and remediate groundwater quality.

Issuance of this Discharge Permit does not relieve the permittee of the responsibility to comply with the WQA, WQCC Regulations, and any other applicable federal, state, and/or local laws, regulations, zoning requirements, and nuisance ordinances.

The following acronyms and abbreviations may be used in this Discharge Permit:

Abbreviation	Explanation	Abbreviation	Explanation
EPA	U.S. Environmental Protection Agency	TCE	Trichloroethene
gpd	gallons per day	TDS	total dissolved solids
mg/L	milligrams per liter	UIC	Underground Injection Control
NMAC	New Mexico Administrative Code	WQA	New Mexico Water Quality Act
NMED	New Mexico Environment Department	WQCC	Water Quality Control Commission
NMSA	New Mexico Statutes Annotated		

II. FINDINGS

In issuing this Discharge Permit, NMED finds the following:

1. The permittee is discharging effluent or leachate from the facility so that such effluent or leachate may move directly or indirectly into groundwater within the meaning of Section 20.6.2.3104 NMAC.
2. The permittee is discharging effluent or leachate from the facility so that such effluent or leachate may move into groundwater of the State of New Mexico that has an existing

concentration of 10,000 mg/L or less of TDS within the meaning of Subsection A of 20.6.2.3101 NMAC.

3. The discharge from the facility is not subject to any of the exemptions of Section 20.6.2.3105 NMAC.
4. The permittee proposes to operate Class V UIC wells within the meaning of 20.6.2.5002.A(1) and 20.6.2.5002.B(5)(d)(i) NMAC which are subject to the prohibitions listed under 20.6.2.5004.A(4) NMAC.

III. AUTHORIZATION TO DISCHARGE

Pursuant to 20.6.2.3104 NMAC, it is the responsibility of the permittee to ensure that discharges authorized by this Discharge Permit are consistent with the terms and conditions herein.

The permittee is authorized to discharge up to 20,000 gpd of potable water and/or groundwater being extracted pursuant to regulatory activities being conducted under the SNL Compliance Order on Consent overseen by the NMED Hazardous Waste Bureau in accordance with the New Mexico Hazardous Waste Act and the New Mexico Solid Waste Act. The groundwater is to be extracted from within a contaminant plume affected by TCE and nitrate, and will be utilized to enhance biologically mediated degradation of the contaminant plume. These contaminants at their measured concentrations may be reinjected into the regional aquifer pursuant to Subsection D(1) of 20.6.2.3109 NMAC. Three UIC wells will be installed via air-rotary, casing-hammer method. The wells to be installed are TAV-INJ1, TAV-INJ2, and TAV-INJ3. Potable water or groundwater being extracted will be mixed with substrate solution components consisting of nutrients, inert tracer elements which will be used as a performance monitoring measure, and microbiologic cultures, collectively referred to as effluent, then gravity-fed into the UIC wells to facilitate in situ bioremediation. Each daily injection will be followed with approximately 100 gallons of chase water consisting of potable water (without amendments) deoxygenated by sparging with argon gas.

[20.6.2.3104 NMAC, Subsection C of 20.6.2.3106 NMAC, Subsection C of 20.6.2.3109 NMAC]

IV. CONDITIONS

The following conditions shall be complied with by the permittee and are enforceable by NMED. NMED issues this Discharge Permit for the discharge of water contaminants subject to the following conditions.

A. OPERATIONAL PLAN

#	Terms and Conditions
1.	The permittee shall implement the following operational plan to ensure compliance with Title 20, Chapter 6, Parts 2 and 4 NMAC.

#	Terms and Conditions
	[Subsection C of 20.6.2.3109 NMAC]
2.	<p>The permittee shall operate in a manner such that standards and requirements of Sections 20.6.2.3101 and 20.6.2.3103 NMAC are not violated.</p> <p>[20.6.2.3101 NMAC, 20.6.2.3103 NMAC, Subsection C of 20.6.2.3109 NMAC]</p>

Operating Conditions

#	Terms and Conditions
3.	<p>Prior to commencing injection activities, the permittee shall demonstrate the mechanical integrity of the aboveground distribution piping and injection well heads associated with this Discharge Permit. Prior to testing, the permittee shall propose for NMED approval the test method to be used. The results of the mechanical integrity testing shall be submitted to NMED within 30 days of test completion and prior to injection.</p> <p>The permittee shall demonstrate mechanical integrity of the aboveground distribution piping and injection well heads associated with this Discharge Permit at least once every five years. If the distribution piping or an injection well head is reconfigured, the permittee must conduct a mechanical integrity test prior to re-injection of effluent into the subsurface at that well.</p> <p>[Subsection C of 20.6.2.3106 NMAC, Subsection A of 20.6.2.3107 NMAC, Subsection B of 20.6.2.5204 NMAC]</p>
4.	<p>The permittee is authorized to install and operate not more than three Class V UIC wells. Initial discharge (Phase 1) shall be to TAV-INJ 1 for a pilot test followed by a full scale implementation of the treatment system. Phase 2 is proposed to include the addition of UIC wells TAV-INJ 2 and TAV-INJ 3 for full scale implementation of the treatment system.</p> <p>[20.6.2.3109.C NMAC, 20.7.10.100 NMAC]</p>
5.	<p>Prior to the first discharge from the system to any of the injection wells, the permittee shall submit written notification to NMED stating the date that the discharge is to commence.</p> <p>[20.6.2.3107.A NMAC]</p>
6.	<p>The permittee shall ensure that the injection treatment facility is secured to control access by the general public.</p> <p>[20.6.2.3109.B-C NMAC, NMSA 1978, §74-6-5.]</p>

#	Terms and Conditions
7.	<p>The permittee shall maintain signs in English and Spanish (unless otherwise prohibited by policy) at appropriate locations indicating that the effluent may not be potable. Signs shall be posted at the UIC wellheads, at any associated storage vessels, and at any other area where there is potential for persons to contact associated materials or equipment.</p> <p>[20.6.2.3109 NMAC.B-C, NMSA 1978, § 74-6-5.D]</p>
8.	<p>The permittee shall ensure that the Class V UIC wells include monitoring devices, i.e., water level and pressure head transducers, to prevent overfilling of the well.</p> <p>[20.6.2.3107, 20.6.2.3109.C(3)(c)(i)]</p>

B. MONITORING AND REPORTING

#	Terms and Conditions
9.	<p>The permittee shall conduct the monitoring, reporting, and other requirements listed below in accordance with the monitoring requirements of this Discharge Permit.</p> <p>[Subsection A of 20.6.2.3107 NMAC, Subsection C of 20.6.2.3109 NMAC]</p>
10.	<p>METHODOLOGY - Unless otherwise approved in writing by NMED, the permittee shall conduct sampling and analysis in accordance with the most recent edition of the following documents.</p> <p>a) American Public Health Association, <i>Standard Methods for the Examination of Water and Wastewater</i> (18th, 19th or current);</p> <p>b) U.S. Environmental Protection Agency, <i>Methods for Chemical Analysis of Water and Waste</i>;</p> <p>c) U.S. Geological Survey, <i>Techniques for Water Resource Investigations of the U.S. Geological Survey</i>;</p> <p>d) American Society for Testing and Materials, <i>Annual Book of ASTM Standards, Part 31. Water</i>;</p> <p>e) U.S. Geological Survey, et al., <i>National Handbook of Recommended Methods for Water Data Acquisition</i>;</p> <p>f) Federal Register, latest methods published for monitoring pursuant to Resource Conservation and Recovery Act regulations; and</p> <p>a) American Society of Agronomy, <i>Chemical Methods: Methods of Soil Analysis; Part 1. Physical and Mineralogical Methods; Part 2. Microbiological and Biochemical Properties; Part 3</i>.</p> <p>[Subsection B of 20.6.2.3107 NMAC]</p>
11.	<p>The permittee shall submit quarterly monitoring reports to NMED for the most recently completed quarterly period by the 1st of February, May, August, and November each year.</p>

#	Terms and Conditions
	<p>The quarterly reports shall document the influent and discharge volumes from the treatment systems, quarterly groundwater and effluent sampling results, and any operations/maintenance activities performed for the prior quarter.</p> <p>Quarterly monitoring shall be performed during the following periods and submitted as follows.</p> <ul style="list-style-type: none"> • January 1st through March 31st (first quarter) – due by August 1st; • April 1st through June 30th (second quarter) – due by November 1st; • July 1st through September 30th (third quarter) – due by February 1st; and • October 1st through December 31st (fourth quarter) – due by May 1st. <p>[Subsection A of 20.6.2.3107 NMAC]</p>
12.	<p>Quarterly reports shall include the following general information:</p> <ol style="list-style-type: none"> a) any periodic test of mechanical integrity conducted; b) any replacement of primary or secondary vessels or associated treatment system infrastructure with an accompanying narrative explanation of the reasons for the decision to replace the vessels; c) any well work-overs conducted; and d) any additional operational changes with the potential to markedly affect the discharge. <p>[20.6.2.3107 NMAC]</p>
13.	<p>Quarterly reports shall include the following system performance information:</p> <ol style="list-style-type: none"> a) monthly average, maximum, and minimum values for flow rate and volume of effluent transferred to each injection well; b) the totalized monthly volume of effluent transferred to each injection well; c) monthly average, maximum, and minimum values of injection water level (pressure head) above static level for each injection well; and d) the volume pumped from each extraction well. <p>Each UIC well shall have a dedicated flow meter. Flow meters shall be inspected and calibrated in accordance with the associated manufacturer's recommendations.</p> <p>[20.6.2.3107 NMAC]</p>
14.	<p>The permittee shall develop a groundwater elevation contour map on a quarterly basis using the top of casing elevation data and quarterly depth-to-most-shallow groundwater measurements obtained from the groundwater monitoring wells required by this Discharge Permit.</p> <p>The groundwater elevation contour map shall depict the groundwater flow direction based on the groundwater elevation contours. Groundwater elevations between monitoring well</p>

#	Terms and Conditions
	<p>locations shall be estimated using common interpolation methods. A contour interval appropriate to the data shall be used, but in no case shall the interval be greater than two feet. Groundwater elevation contour maps shall depict the groundwater flow direction, using arrows, based on the orientation of the groundwater elevation contours, and the location and identification of each monitoring well and contaminant source. The groundwater elevation contour map shall be submitted to NMED in the quarterly monitoring reports.</p> <p>[20.6.2.3107 NMAC]</p>
15.	<p>NMED shall have the option to perform downhole inspections of all monitoring and UIC wells identified in this Discharge Permit. NMED shall establish the inspection date and provide at least a 60-day notice to the permittee by certified mail. The permittee shall have any existing dedicated pumps removed at least 48 hours prior to NMED inspection to allow adequate settling time of sediment agitated from pump removal.</p> <p>Should a facility not have existing dedicated pumps, but decide to install pumps in any of the monitoring wells, NMED shall be notified at least 90 days prior to pump installation so that a downhole well inspection(s) can be scheduled prior to pump placement.</p> <p>All confirmation analysis will be conducted by an independent environmental laboratory that is certified under the National Environmental Laboratory Accreditation Program (NELAP).</p> <p>[Subsections A and D of 20.6.2.3107 NMAC]</p>

Facility Monitoring Conditions

#	Terms and Conditions
16.	<p>Groundwater samples shall be collected from each new injection well and associated monitoring well prior to discharge, and analyzed for the constituents listed below to establish baseline conditions prior to substrate injection.</p> <ul style="list-style-type: none"> • Alkalinity (total, bicarbonate and carbonate) • Ammonia (as nitrogen) • Anions (bromide, chloride, fluoride, nitrite and sulfate) • Dehalococcoides • Dissolved metals (arsenic, calcium, iron, magnesium, manganese, potassium, sodium) • Methane/ethane • Nitrate as nitrogen • Nitrite as nitrogen

#	Terms and Conditions
	<ul style="list-style-type: none"> • Nitrate plus nitrite (as nitrogen) • Orthophosphate (as phosphorus) • Total organic carbon • Sulfide • Volatile organic compounds <p>Field parameters pH, specific conductivity, temperature, turbidity, dissolved oxygen, and oxidation reduction potential shall also be collected.</p> <p>[20.6.2.3107 NMAC]</p>
17.	<p>The permittee shall monitor the groundwater wells TAV-MW6, TAV-MW7, TAV-MW-10, and LWDS-MW-1 quarterly to determine any change to aquifer chemistry and aquifer flow direction that may be the result of injection.</p> <p>This quarterly monitoring shall include analysis for the following analytes:</p> <ul style="list-style-type: none"> • TCE • Nitrate as nitrogen • Nitrite as nitrogen • Nitrate plus nitrite (as nitrogen) • Arsenic • Iron • Manganese • cis-1,2-DCE • Vinyl chloride • Ethene <p>Annual sampling will include general chemistry, radiological screening parameters, and total metals as proposed by the permittee to supplement waste characterization requirements and as required under the SNL Compliance Order on Consent.</p> <p>If the chemical quality of the groundwater being injected changes over time, NMED may require the permittee to conduct geochemical modeling to predict the interaction between the injection fluid and receiving groundwater. Results of all geochemical modeling shall be provided to NMED and shall include predictions on any changes to aquifer porosity and hydraulic conductivity that may result from mineral precipitation or dissolution.</p> <p>[20.6.2.3107 NMAC]</p>

C. CONTINGENCY PLAN

#	Terms and Conditions
18.	<p>In the event that groundwater monitoring indicates that a groundwater quality standard identified in Section 20.6.2.3103 NMAC is exceeded, or a toxic pollutant (defined in Subsection WW of 20.6.2.7 NMAC) is present in a groundwater sample and in any subsequent groundwater sample collected from a monitoring well required by this Discharge Permit that is attributable to this discharge, the permittee shall enact the following contingency plan.</p> <p>Within 60 days of the receipt of subsequent sample analysis results, the permittee shall propose measures to ensure that the exceedance of the standard or the presence of a toxic pollutant will be mitigated by submitting a corrective action plan to NMED for approval. The corrective action plan shall include a description of the proposed actions to control the source and an associated completion schedule. The plan shall be enacted as approved by NMED.</p> <p>Once invoked (whether during the term of this Discharge Permit, or after the term of this Discharge Permit and prior to the completion of the Discharge Permit closure plan requirements), this condition shall apply until the permittee has fulfilled the requirements of this condition and groundwater monitoring confirms for a minimum of two years of consecutive groundwater sampling events that the standards of Section 20.6.2.3103 NMAC are not exceeded and toxic pollutants are not present in groundwater.</p> <p>The permittee may be required to abate water pollution pursuant to Sections 20.6.2.4000 through 20.6.2.4115 NMAC, should the corrective action plan not result in compliance with the standards and requirements set forth in Section 20.6.2.4103 NMAC within 180 days of confirmed groundwater contamination.</p> <p>[Subsection A of 20.6.2.3107 NMAC, Subsection E of 20.6.2.3109 NMAC]</p>
19.	<p>In the event that a release ("spill") occurs that is not authorized under this Discharge Permit, the permittee shall take measures to mitigate damage from the unauthorized discharge and initiate the notifications and corrective actions required in Section 20.6.2.1203 NMAC and summarized below.</p> <p>Within 24 hours following discovery of the unauthorized discharge, the permittee shall verbally notify NMED and provide the following information.</p> <ul style="list-style-type: none"> a) The name, address, and telephone number of the person or persons in charge of the facility, as well as of the owner and/or operator of the facility. b) The name and address of the facility. c) The date, time, location, and duration of the unauthorized discharge. d) The source and cause of unauthorized discharge. e) A description of the unauthorized discharge, including its estimated chemical composition.

#	Terms and Conditions
	<p>f) The estimated volume of the unauthorized discharge.</p> <p>g) Any actions taken to mitigate immediate damage from the unauthorized discharge.</p> <p>Within one week following discovery of the unauthorized discharge, the permittee shall submit written notification to NMED with the information listed above and any pertinent updates.</p> <p>Within 15 days following discovery of the unauthorized discharge, the permittee shall submit a corrective action report/plan to NMED describing any corrective actions taken and/or to be taken relative to the unauthorized discharge that includes the following information.</p> <p>a) A description of proposed actions to mitigate damage from the unauthorized discharge.</p> <p>b) A description of proposed actions to prevent future unauthorized discharges of this nature.</p> <p>c) A schedule for completion of proposed actions.</p> <p>In the event that the unauthorized discharge causes or may with reasonable probability cause water pollution in excess of the standards and requirements of Section 20.6.2.4103 NMAC, and the water pollution will not be abated within 180 days after notice is required to be given pursuant to Paragraph (1) of Subsection A of 20.6.2.1203 NMAC, the permittee may be required to abate water pollution pursuant to Sections 20.6.2.4000 through 20.6.2.4115 NMAC.</p> <p>Nothing in this condition shall be construed as relieving the permittee of the obligation to comply with all requirements of Section 20.6.2.1203 NMAC.</p> <p>[20.6.2.1203 NMAC]</p>
20.	<p>In the event that NMED or the permittee identifies any failures of the discharge plan or this Discharge Permit not specifically noted herein, NMED may require the permittee to submit a corrective action plan and a schedule for completion of corrective actions to address the failure(s). Additionally, NMED may require a Discharge Permit modification to achieve compliance with 20.6.2 NMAC.</p> <p>[Subsection A of 20.6.2.3107 NMAC, Subsection E of 20.6.2.3109 NMAC]</p>

D. CLOSURE PLAN

#	Terms and Conditions
21.	<p>Upon cessation of the activity pursuant to the discharge permit, the permittee shall perform the following closure measures for this Discharge Permit:</p> <p>a) Cap, plug, or remove all lines to prevent the discharge to all UIC wells;</p> <p>b) Abandon UIC wells in accordance with State of New Mexico Oil Conservation Division guidelines as described in the <i>Oil Conservation Division Underground</i></p>

Injection Control Program Manual, February 26, 2004 and/or change well classification;

- c) Appropriately dispose of liquids, solids, and treatment media; and
- d) Submit a request to NMED to terminate this Discharge Permit.

Upon cessation of the closure measures, the permittee shall perform the following post-closure measures:

- e) Continue groundwater monitoring for at least two years, or as appropriate and in concurrence with NMED;
- f) Enact contingency plans if groundwater standards are exceeded, including any abatement required by NMED pursuant to actions related to this discharge permit; and
- g) Following notification from NMED that post-closure monitoring may cease, the permittee shall plug and abandon the monitoring well(s) in accordance with the attachment titled *Ground Water Discharge Permit Monitoring Well Construction and Abandonment Conditions*, Revision 1.1, March 2011.

When all post-closure requirements have been met, the permittee may request to terminate the discharge permit.

[20.6.2.3107 (A)11 NMAC]

E. GENERAL TERMS AND CONDITIONS

#	Terms and Conditions
22.	<p>RECORD KEEPING - The permittee shall maintain a written record of:</p> <ul style="list-style-type: none"> • information and data used to complete the application for this Discharge Permit; • any releases ("spills") not authorized under this Discharge Permit and reports submitted pursuant to 20.6.2.1203 NMAC; • the operation, maintenance, and repair of all facilities/equipment used to treat, store, or dispose of wastewater; • facility record drawings (plans and specifications) showing the actual construction of the facility and bearing the seal and signature of a licensed New Mexico professional engineer; • copies of monitoring reports completed and/or submitted to NMED pursuant to this Discharge Permit; • the volume of wastewater or other wastes discharged pursuant to this Discharge Permit; • groundwater quality and wastewater quality data collected pursuant to this Discharge Permit; • copies of construction records (well logs) for all groundwater monitoring wells required to be sampled pursuant to this Discharge Permit; • the maintenance, repair, replacement or calibration of any monitoring equipment or flow measurement devices required by this Discharge Permit; and

#	Terms and Conditions
	<ul style="list-style-type: none"> data and information related to field measurements, sampling, and analysis conducted pursuant to this Discharge Permit, including: <ul style="list-style-type: none"> the dates, location, and times of sampling or field measurements; the name and job title of the individuals who performed each sample collection or field measurement; the sample analysis date of each sample; the name and address of the laboratory, and the name of the signatory authority for the laboratory analysis; the analytical technique or method used to analyze each sample or collect each field measurement; the results of each analysis or field measurement, including raw data; the results of any split, spiked, duplicate or repeat sample; and a copy of the laboratory analysis chain-of-custody as well as a description of the quality assurance and quality control procedures used. <p>The written record shall be maintained by the permittee at a location accessible during a facility inspection by NMED for a period of at least five years from the date of application, report, collection, or measurement and shall be made available to the department upon request.</p> <p>[Subsections A and D of 20.6.2.3107 NMAC]</p>
23.	<p>INSPECTION and ENTRY - The permittee shall allow inspection by NMED of the facility and its operations that are subject to this Discharge Permit and the WQCC regulations. NMED may, upon presentation of proper credentials, enter at reasonable times upon or through any premises in which a water contaminant source is located or in which are located any records required to be maintained by regulations of the federal government or the WQCC.</p> <p>The permittee shall allow NMED to have access to and reproduce for their use any copy of the records, and to perform assessments, sampling, or monitoring during an inspection for the purpose of evaluating compliance with this Discharge Permit and the WQCC regulations.</p> <p>Nothing in this Discharge Permit shall be construed as limiting in any way the inspection and entry authority of NMED under the WQA, the WQCC Regulations, or any other local, state, or federal regulations.</p> <p>[Subsection D of 20.6.2.3107 NMAC, NMSA 1978, §§ 74-6-9.B and 74-6-9.E]</p>
24.	<p>DUTY to PROVIDE INFORMATION - The permittee shall, upon NMED's request, allow for NMED's inspection/duplication of records required by this Discharge Permit and/or furnish to NMED copies of such records.</p>

#	Terms and Conditions
	[Subsection D of 20.6.2.3107 NMAC]
25.	<p>MODIFICATIONS and/or AMENDMENTS - In the event the permittee proposes a change to the facility or the facility's discharge that would result in a change in the volume discharged; the location of the discharge; or in the amount or character of water contaminants received, treated, or discharged by the facility, the permittee shall notify NMED prior to implementing such changes. The permittee shall obtain approval (which may require modification of this Discharge Permit) by NMED prior to implementing such changes.</p> <p>[Subsection C of 20.6.2.3107 NMAC, Subsections E and G of 20.6.2.3109 NMAC]</p>
26.	<p>PLANS and SPECIFICATIONS - In the event the permittee is proposing to construct a wastewater system or change a process unit of an existing system such that the quantity or quality of the discharge will change substantially from that authorized by this Discharge Permit, the permittee shall submit construction plans and specifications to NMED for the proposed system or process unit prior to the commencement of construction.</p> <p>In the event the permittee implements changes to the wastewater system authorized by this Discharge Permit that result in only a minor effect on the character of the discharge, the permittee shall report such changes (including the submission of record drawings, where applicable) as of January 1 and June 30 of each year to NMED.</p> <p>[Subsections A and C of 20.6.2.1202 NMAC, NMSA 1978, §§ 61-23-1 through 61-23-32]</p>
27.	<p>CIVIL PENALTIES - Any violation of the requirements and conditions of this Discharge Permit, including any failure to allow NMED staff to enter and inspect records or facilities, or any refusal or failure to provide NMED with records or information, may subject the permittee to a civil enforcement action. Pursuant to WQA 74-6-10(A) and (B), such action may include a compliance order requiring compliance immediately or in a specified time, assessing a civil penalty, modifying or terminating the Discharge Permit, or any combination of the foregoing; or an action in district court seeking injunctive relief, civil penalties, or both. Pursuant to WQA 74-6-10(C) and 74-6-10.1, civil penalties of up to \$15,000 per day of noncompliance may be assessed for each violation of the WQA 74-6-5, the WQCC Regulations, or this Discharge Permit, and civil penalties of up to \$10,000 per day of noncompliance may be assessed for each violation of any other provision of the WQA, or any regulation, standard, or order adopted pursuant to such other provision. In any action to enforce this Discharge Permit, the permittee waives any objection to the admissibility as evidence of any data generated pursuant to this Discharge Permit.</p> <p>[20.6.2.1220 NMAC, NMSA 1978, §§ 74-6-10 and 74-6-10.1]</p>
28.	CRIMINAL PENALTIES - No person shall: